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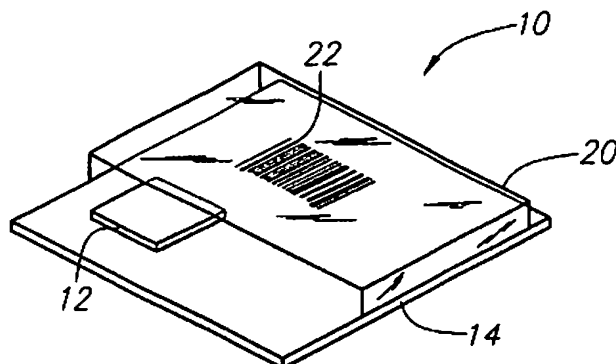
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(54) Title: INTEGRATED CIRCUIT PACKAGE WITH DEVICE SPECIFIC DATA STORAGE



(57) Abstract: A data storage system for integrated circuit packages includes an integrated circuit package, the package having a semiconductor element and a lid covering the semiconductor element, wherein the lid includes a data storage component contained on one or more exterior surfaces of the integrated circuit package. Data retrieval means may also be provided. By way of examples, the data storage component may be a bar code, a digitally encoded etching, or an electronic memory element.

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INTEGRATED CIRCUIT PACKAGE WITH DEVICE SPECIFIC DATA STORAGE

BACKGROUND OF THE INVENTION

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Field of the Invention

The present invention pertains generally to the field of radio frequency (RF) power transistor devices and, more specifically, to systems and methods for storing device-specific data in an RF power transistor package and for retrieving that
10 information.

Background

Integrated circuits (IC) are widely used in many applications and have various characteristics depending on their intended use. The electrical characteristics of IC's
15 may also vary for the same type of device, e.g., due to manufacturing variables. IC's include an arrangement of electrical components often protected by an electrically insulated lid. Typically, the lid serves this protective function while also allowing for heat dissipation from the circuit.

In known devices, the lid of an integrated circuit may have a minimum amount
20 of device data printed on its surface. Examples of such information may include a manufacturer's serial number or a part number. Rarely is any more information included on the surface of the integrated circuit because of their small physical size and the need for the information to be printed large enough for a human to easily read it. It is thus desirable to provide an integrated circuit that has the ability to store a
25 significant amount of device-specific data, while enabling a user to easily access and read the information. Examples of such device-specific data may include the manufacturing history or testing parameters of the device, quality control data, calibration information, instructions on tuning, mounting, or otherwise using the device, and other data that a manufacturer may want to provide to a user.

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SUMMARY OF THE INVENTION

In accordance with a first aspect of the invention, a data storage system for integrated circuit packages is provided, comprising an integrated circuit package, the package having a semiconductor element and a lid covering the semiconductor element, wherein the lid includes a data storage component contained on one or more exterior surfaces of the integrated circuit package. In preferred embodiments, the data storage system may further include data retrieval means.

In one preferred embodiment, the data storage component comprises a bar code. In another preferred embodiment, the data storage component comprises a digitally encoded etching. In still another preferred embodiment, the data storage component comprises an electronic memory element.

In accordance with another aspect of the invention, a data storage system for integrated circuit packages is provided, comprising an integrated circuit package, the package having a semiconductor element and a lid covering the semiconductor element, the semiconductor element including a memory element capable of storing data specific to the integrated circuit package, circuitry for retrieving the data from the memory element, and an electrical lead for electrically connecting a measuring device to the circuitry.

In preferred embodiments, the data storage system may further comprise updating circuitry electrically coupled to the memory element, wherein the updating circuitry manipulates the data stored in the memory element based on changes made to the integrated circuit.

In accordance with still another aspect of the invention, a method for storing and retrieving device specific data is provided. In a preferred implementation, the method includes writing device-specific data to a memory element coupled to an integrated circuit, providing circuitry to read the device-specific data from the memory element, and reading the data with an electrical measuring device connected to the electrical lead.

In further preferred implementations, the method also includes decoding the data and displaying the data, as well as updating the data stored in the memory element based on changes made to the integrated circuit.

As will be apparent to those skilled in the art, other and further aspects of the present invention will appear hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings, in which like reference numerals refer to like components, and in which:

FIG. 1 is a first embodiment of an integrated circuit package constructed in accordance with the present invention.

FIG. 2 is a second embodiment of an integrated circuit package constructed in accordance with the present invention; and

FIG. 3 is a third embodiment of an integrated circuit package constructed in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, an integrated circuit (IC) package 10 includes an integrated circuit 12 mounted on a substrate 14. The IC package is provided with a lid 20. Device-specific data is encoded in a bar code 22 on the lid 20. Since the lid 20 is usually the most accessible part of the IC, this is a preferable place to locate this information. The bar code may, however, be printed on any other accessible part of the IC package.

After the bar code is printed on the lid (e.g., at manufacturing time), the data can then be read by any known bar code system. Such systems include hand-held scanners connected to a computer for processing and displaying the data. Bar code

technology is widely known in the field and various means of reading the bar code are contemplated by a device constructed in accordance with the present invention.

Fig. 2 shows a second embodiment of the invention where the device-specific data 24 is encoded in a digital format and etched onto the lid 20. This data 24 is
5 capable of being read by an optical device and decoded by a computer. The technology for this is generally known in the art of CD ROM devices.

Fig. 3 shows a third embodiment of the invention where the IC package 10 contains a memory element 26 capable of electronically storing the device-specific data. Preferably, the memory element 26 is a static memory that does not require a
10 constant power source to save the stored memory. Also provided are electrical leads 28 and 30 for accessing the data stored in the memory element 26. The leads 28 and 30 may be incorporated into the pins of the IC that are connected to a standard circuit board, or they may have a separate port (e.g., in the lid) that may be directly accessed by an electrical measuring device.

15 Several methods of data transfer between an external device and the memory element 26 are possible, and well known in the electrical arts. One embodiment of the invention uses the leads DATA_IN/OUT, READY, and IN/OUT. The IC contains input/output circuitry that is electrically coupled to the memory element and the leads. A procedure for storing data into the memory element would involve setting the
20 IN/OUT lead to "IN" (e.g., "on"). The READY lead is set "on" and the data is then read from the DATA_IN/OUT lead to the memory element by the input/output circuitry. This process is repeated to store the remaining bits of information to the memory element. A procedure for retrieving data from the memory element would involve setting the IN/OUT lead to "OUT" (e.g., "off"). The READY lead is set "on"
25 and the data is then read from the memory to the DATA_IN/OUT lead by the input/output circuitry. This process is repeated to read the remaining contents of the memory element. An improvement of this system would involve providing several leads for data transfer (DATA_IN/OUT), allowing for faster reading and writing of the memory.

Another aspect of this embodiment involves updating the data in the memory element in response to certain circuit conditions or events. The updating circuitry is configured to measure certain electrical conditions during the operation of the IC (e.g., the highest current passing through a certain pin of the IC), and, upon the occurrence
5 of a certain event (e.g., a current is measured on that pin that is higher than the value already stored in the memory element), the updating circuitry writes new data to the memory element.

Although the invention has been described and illustrated in the above description and drawings, it is understood that this description is by example only and
10 that numerous changes and modifications can be made by those skilled in the art without departing from the true spirit and scope of the invention.

The invention, therefore, is not to be restricted, except by the following claims and their equivalents.

WHAT IS CLAIMED IS:

1. A data storage system for integrated circuit packages, comprising:
an integrated circuit package, the package having a semiconductor element and
a lid covering the semiconductor element;
5 wherein the lid includes a data storage component contained on one or more
exterior surfaces of the integrated circuit package.
2. The data storage system of claim 1, further comprising data retrieval means.
- 10 3. The data storage system of claim 1, wherein the data storage component
comprises a bar code.
4. The data storage system of claim 1, wherein the data storage component
comprises a digitally encoded etching.
- 15 5. The data storage system of claim 1, wherein the data storage component
comprises an electronic memory element.
6. A data storage system for integrated circuit packages, comprising:
20 an integrated circuit package, the package having a semiconductor element and
a lid covering the semiconductor element, the semiconductor element including:
a memory element capable of storing data specific to the integrated
circuit package;
circuitry for retrieving the data from the memory element; and
25 an electrical lead for electrically connecting a measuring device to the
circuitry.
7. The data storage system of claim 6, further comprising updating circuitry
electrically coupled to the memory element, wherein the updating circuitry manipulates
30 the data stored in the memory element based on changes made to the integrated circuit.

8. A method for storing and retrieving device-specific data, comprising:
writing device-specific data to a memory element coupled to an integrated
circuit;
5 providing circuitry to read the device-specific data from the memory element;
and
reading the data with an electrical measuring device connected to the electrical
lead.
- 10 9. The method of claim 8, further comprising decoding the data and displaying the
data.
10. The method of claim 8, further comprising updating the data stored in the
memory element based on changes made to the integrated circuit.

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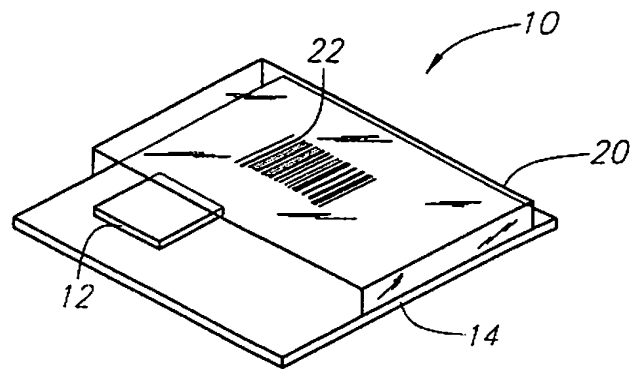


FIG. 1

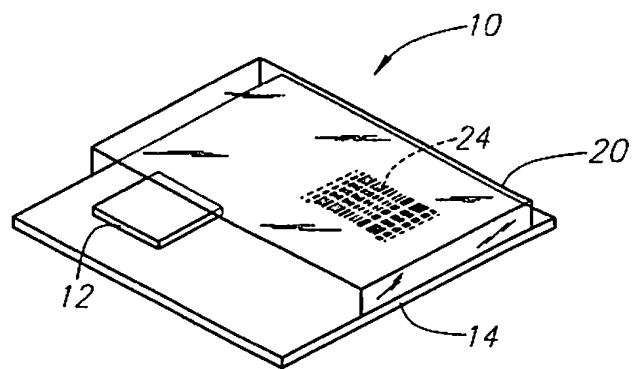


FIG. 2

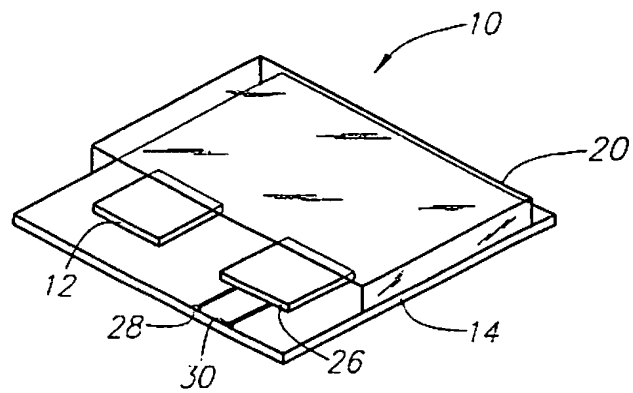


FIG. 3